and Distomidæ do not correspond exactly to any of Giard's families, but the former is Milne-Edwards' "Polycliniens" without change. A new family, the Chondrostachyidæ, has been formed for the reception of Macdonald's *Chondrostachys* and von Drasche's *Oxycorynia*, remarkable forms in which the Ascidiozooids are placed upon a common peduncle penetrated by large canals. I am inclined to admit the necessity for this new family, and several undescribed and interesting forms obtained during the *Challenger* Expedition will, I hope, take up a position within its bounds. The two remaining families of von Drasche's system, the Clavelinidæ and the Perophoridæ, I would still maintain are more closely allied to the simple than to the compound Ascidians. They correspond to Family IV. Clavelinidæ of my arrangement of the Ascidiæ Simplices.

Dr. von Drasche does not define the Synascidiæ, and from one or two passages in his work it seems probable that he is in very much the position in which I now find myself, viz. unable to find any character or combination of characters which will serve to distinguish simple from compound Ascidians. Reproduction by gemmation and the formation of colonies in the latter group will not hold, since it is possible to pass from *Ciona*—a typical simple Ascidian—to *Distoma* and the very heart of the compound Ascidians through the following series of forms, which shows a perfect gradation of these characters :—*Ciona, Rhopalœa, Ecteinascidia, Clavelina, Diazona, Chondrostachys, Oxycorynia, Distoma.* The formation of common cloacal cavities, canals, and apertures cannot be considered as a diagnostic feature of the compound Ascidians. Although Giard has demonstrated their presence in some genera in which they were previously unknown, yet there are some forms considered by all authorities as Synascidiæ, such as *Chondrostachys, Diazona, Distoma*, and others, in which the atrial apertures of the Ascidiozooids open independently on the surface of the colony, and no common cloaca is formed.

Lastly, we come to characters taken from the condition of the test, but these break down like the others. In the first place, in passing along the series of forms mentioned above as connecting *Ciona* and *Distoma*, we encounter all stages between a distinct test or tunic for each individual and a common mass in which a number of Ascidiozooids are embedded. And, secondly, the remarkable group "Polystyelæ," briefly characterised by Giard in 1874, presents many of the characters of highly differentiated simple Ascidians (the Cynthiidæ), along with the supposed Synascidian feature of a colony composed of many Ascidiozooids completely buried in a common test.

In the *Challenger* collection there is an interesting series of Polystyelæ—all from southern seas—in which it is possible, I believe, to trace a passage from such aggregated Styelinæ as *Polycarpa* to the Botryllidæ. If this passage indicated genetic affinity between these two very distinct groups, which I greatly doubt, it would be impossible to escape from the conclusion that the Ascidiæ Simplices and the Ascidiæ Compositæ have *two* points of connection, almost at the extreme ends of the two series. I think I am justified in believing that probably both groups were derived from a form not unlike *Ecteinascidia* or *Clavelina.* From this common ancestor the simple Ascidians diverged through the Ascidiidæ to the Cynthiidæ (including *Polycarpa*) and the Molgulidæ, while the compound Ascidians diverged through *Diazona* and the Chondrostachyidæ to the Polyclinidæ, Didemnidæ, and Botryllidæ. Hence it seems much more probable that the Polystyelæ have acquired independently certain characters of *Polycarpa* or of *Botryllus* (I have not yet been able to determine to which of the two they are really most closely related) than that there is any direct affinity between such highly differentiated groups as the Cynthiidæ and the Botryllidæ. This, however, does not affect the practical difficulty that the Polystyelæ completely bridge across the gap between simple and compound Ascidians as distinguished by the nature of the test or tunic, and consequently it is extremely difficult to separate them from either of these two great series.

Thus all the diagnostic features usually employed fail utterly, and we find ourselves unable to discover a single character or combination of characters which will serve to distinguish the Ascidiæ Simplices from the Ascidiæ Compositæ.

W. A. HERDMAN

A METEOROLOGICAL LABORATORY

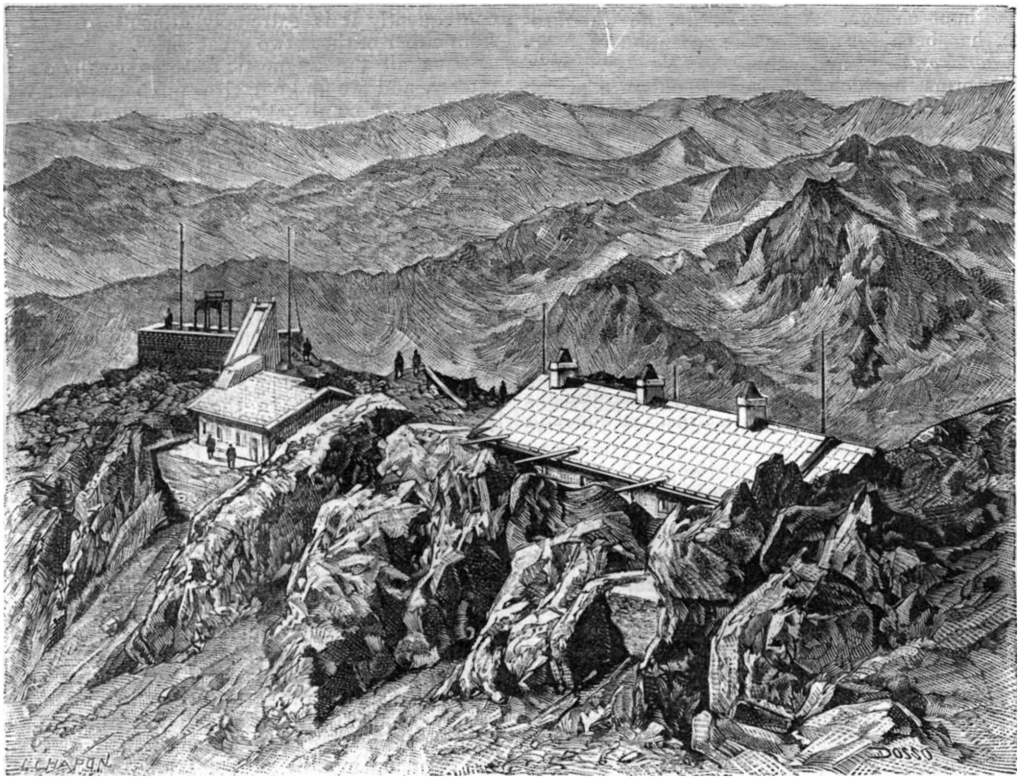
TO the last issue of *Science et Nature* M. L. Mangin contributes an interesting account of the chemical laboratory recently installed on the Pic du Midi, Pyrenees, at an altitude of nearly 9500 feet above the sea. As shown in our first illustration, the laboratory stands between the dwelling-house and the Observatory, of which it forms a dependency, under the direction of MM. Müntz and Aubin. In the second illustration a fuller view is given of the building, which faces southwards, and the slated roof of which is so constructed as to constitute a sort of pluviometer registering the annual rainfall, and retaining sufficient for chemical analysis. This unique establishment, which promises to render great services both to meteorology and to the economic industries, is at present chiefly occupied with the constituent elements of the terrestrial atmosphere, especially in connection with vegetable life. The student of chemistry need scarcely be reminded that, besides oxygen and nitrogen, the air contains in smaller proportions carbonic acid, ammonia, and certain nitric compounds playing an important part in the nutrition of plants, and supplying them with nearly all the nitrogen and carbon that enter into the composition of their tissues. During the summer months of the years 1881-82, MM. Müntz and Aubin were mainly engaged with the quantitative analysis of these substances, under conditions peculiarly favourable for the prosecution of such investigations. The results so far obtained may here be briefly resumed.

Carbonic Acid.—The proportion of this element found in the air at different altitudes is still a subject of discussion amongst analytical chemists. But de Saussure's average of from ·0004 to ·0006 has been shown to be considerably too high by various observations taken of late years at different stations on the globe. These observations are now fully confirmed by the researches on the Pic du Midi, which reduce the average to 2·86 ten-thousandths.

Another important conclusion is that the carbonic acid does not perceptibly vary with the altitude, as had hitherto been supposed. Thus the proportion is found to be much the same at Vincennes near Paris, Luz (740 m.), Pierrefitte (500 m.), and Pic du Midi (2900 m.). On the other hand, the quantity varies slightly in the same locality, being somewhat greater at night and in moist weather than during the day and in dry weather. The subjoined table shows the average quantity of carbonic acid present in the atmosphere during the day and at night at various meteorological stations in different parts of the world :—

	Night	Day
Vincennes	2·98 ...	2·84
Pic du Midi... ...	2·90 ...	2·86
Hayti	2·92 ...	2·70
Florida	2·94 ...	2·89
Martinique	2·85 ...	2·73
Mexico...	2·86 ...	2·66
Patagonia	2·67 ...	2·66
Chili	2·82 ...	2·66

Ammonia.—Although the presence of ammonia in the air has long been known, Schlösing was the first to show that for this substance, as well as for carbonic acid, the sea is the great reservoir whence the atmosphere receives its supplies. But no light had hitherto been thrown upon



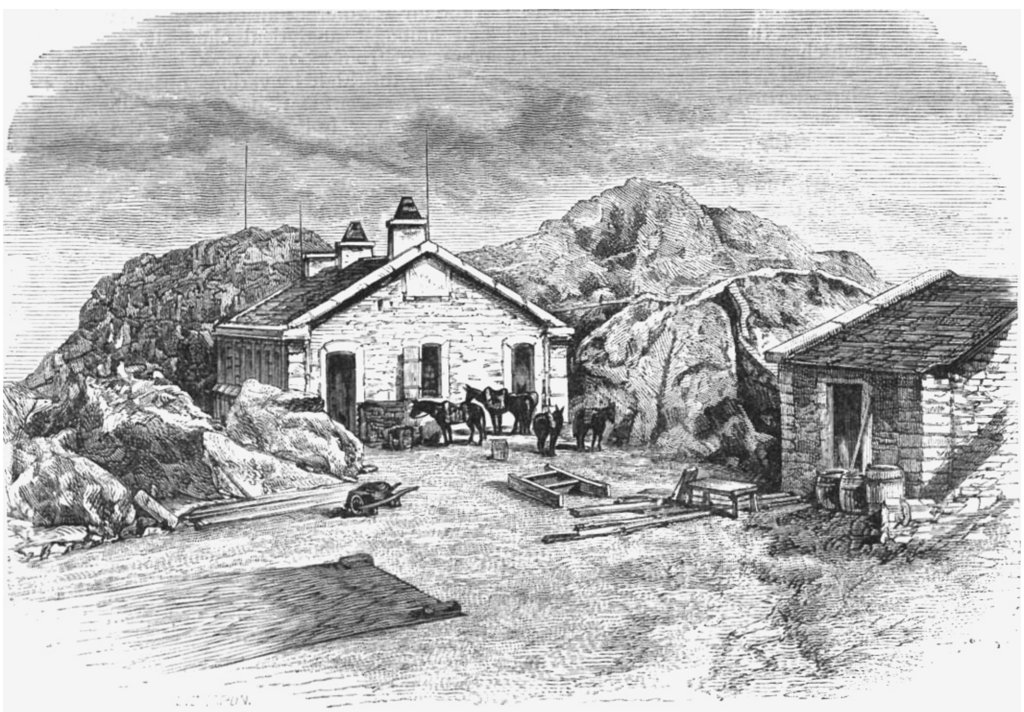


Fig. 2.—The Observatory and Laboratory.

the distribution of ammonia at different altitudes. Examining the atmosphere from this point of view, MM. Müntz and Aubin now find that at an elevation of nearly 3000 m. the quantity does not sensibly differ from that at extremely low levels, which is ascertained to be about 1·35 mgr. to 100 c.m. Hence the diffusion of ammonia in the air is as complete as that of carbonic acid. Consequently it is in the gaseous state that this substance is incessantly transmitted from the marine basins to the atmosphere. The rain and snow collected on the Pic du Midi also revealed the presence of ammonia in solution, as was to be expected.

Atmospheric Nitrification.—The analysis of rain falling during thunderstorms is known invariably to yield certain nitrous compounds in the form of sal ammoniac. From what is known regarding the affinities of nitrogen, it is argued that these compounds are developed under the influence of electric discharges. The nitrous compounds (nitric acid and sub-nitric acid) are converted, in the presence of water and of ammonia, into sal ammoniacs, which are precipitated by the rain. Hence electric disturbances in the air came to be regarded as the chief source of nitrous compounds.

MM. Müntz and Aubin have analysed by the most delicate processes the rain-water collected on the Pic du Midi, but never succeeded in detecting any nitrates in it, although they are always present in rain-water collected on the plains. Their absence corresponds with the absence of thunderstorms taking their rise above the Pic du Midi. Of 184 storms observed during a period of nearly nine years by M. de Nansouty, the director of the Observatory, not more than twenty-three originated at an altitude of over 2300 m.; but in no case were electric phenomena observed at an elevation higher than 3000 m. Hence the electric discharges, which give rise to the nitrates, are limited to the lower atmospheric regions between sea-level and 3000 m. above the sea.

To the general results here resumed MM. Müntz and Aubin have added some details concerning the formation of vegetable soil. They have distinctly determined the presence of nitric ferment in the ground on the highest summits. But owing to the low temperature prevailing at those altitudes, the activity of this ferment is extremely weak.

It may be observed in conclusion that the uniform proportion of carbonic acid and ammonia in the atmosphere, as determined by these remarkable researches, is a fresh confirmation of Schlösing's theory regarding the interchange of gases between the sea and the air. The marine basins are incessantly discharging or absorbing carbonic acid and ammonia in such a way as to maintain the constant proportion of these substances. They thus constitute a vast regulator, restoring to the atmosphere the nitrous or carbonic compounds of which it had been deprived by vegetation.

SCIENCE IN ROME

THE recent changes introduced into the constitution of the Accademia dei Lincei, followed by its removal to new and sumptuous quarters in Trastevere, seem to call for more than a passing notice. There are certainly many other famous societies scattered over the Peninsula, all the large towns of which have long possessed one or more scientific, literary, or artistic corporations. But, with perhaps the single exception of the Florentine Academy, none of them have been so intimately identified with the progress of the physical sciences since the "Renaissance" as this oldest of still existing learned institutions. Founded on August 17, 1603, by the young prince, Federigo Cesi, for the express purpose of cultivating "le scienze matematiche e filosofiche," it began its useful career forty years before the birth of Newton, and six before Galileo had rendered Jansen's telescope a suitable instrument for astronomic observation. The very name of the Lincei, or "Lynx-eyed,"[1] breathes the quaint spirit of the times, when every capital in Italy had its centres of intellectual movement, bearing such eccentric titles as the Accademia dei Sonnacchiosi ("The Drowsy"), dei Sitibondi ("The Thirsty"), dei Svegliati ("The Wide-Awake"), degli Ottusi ("The Dull"), degli Innomati ("The Nameless"), dei Storditi ("The Dazed"), dei Tenebrosi ("The Darklings"), and so forth. But while most of these ephemeral corporations have left little but their names behind them, the Lincei have gone on prospering and continually widening the field of their utility until the Academy now finds itself formally constituted the chief national exponent of the natural sciences in Italy, thus taking rank with the French Institute and the Royal Society of London.

Although such a proud position could scarcely have been anticipated by its founder, the Academy none the less possessed from the outset certain elements of stability, which under favourable circumstances could not fail to insure it a prolonged existence. Its generous patron not only provided it with a home in his ancestral palace, but also placed at its disposal a botanical garden, a rich museum and a choice library soon increased the valuable collection of Virginio Cesarini. Its three first members, the founder, Fabio Colonna, and Francesco Stellati, were all noted for their varied accomplishments, and Colonna especially, at once a mathematician, philosopher, painter, musician, and *savant*, may be regarded as the greatest of botanists previous to Linné.[2]

During the seven first years after its foundation, Gaetano Marini tells us that the Academy "dared to stand up against the tyranny of the Peripatetics, and to introduce a new and more certain method of philosophy, bravely and religiously enduring a long and most unworthy persecution" (*Ist.* i. p. 493). The reference in the last clause, necessarily worded somewhat vaguely, is to the action taken by the Lincei in defence of Galileo, who had joined the Academy, and who had in 1615 received his first summons to Rome to recant his "errors." A feeble attempt seems to have been made to continue the struggle between light and darkness till 1632, when Galileo was finally "suppressed." The "Lynx-eyed" were now shrewd enough to perceive that they had fallen upon times when silence was "golden." Henceforth for many years their records are practically a blank, broken only in 1651 by the publication under their auspices of Francisco Hernandez's great work on the natural history of Mexico.

After the untimely death of Prince Cesi in 1630 the Academicians, now numbering thirty-two members and foreign associates, received a temporary shelter in the house of the Commendator Cassiano del Pozzo. Their first organic constitution had been issued in 1624, and since that period both residence and regulations have been subjected to many changes. After the political unification of Italy and the selection of Rome for its capital, fresh modifications became inevitable, and a new constitution was published in the year 1875. But so rapid has been the progress of the natural sciences, and so great the zeal displayed by the Lincei in the cause for which their predecessors endured "a long and most unworthy persecution," that further alterations in the sense of expansion were soon felt to be imperative. According to the reform introduced in July 1883, better provision is made for the cultivation of all branches of physics by the final and absolute exclusion of the arts and letters. The new

[1] Tiraboschi tells us that this title was adopted "per chè gli accademici presero a lor simbolo un lince, a spiegar l'acutezza con cui si erano prefissi di osservare e di studiar la natura" (viii. p. 72).

[2] "Quicumque," says Boerhaave, "historiam antiquitatis plantarum scire vult, legat opera Fabii Columnæ, qui vix habet similem, sed quidem imitatores" ("Method. discend. Medic.," pars 4, § 8). Colonna, who was born in Naples in 1567, and died an octogenarian in 1647, was also the inventor of the musical instrument by him named the "sambuco linceo," in honour of the Academy.